DOUBLE ACTING TORQUE CHUCK

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] Not Applicable.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable.

REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM LISTING COMPACT DISK APPENDIX

[0003] Not Applicable.

BACKGROUND OF THE INVENTION

[0004] The following invention relates to a chuck for engaging the hollow core of a roll or web of material. Large rolls of material, such as paper webs, are often handled by placing the roll on a chuck or mandrel. Often however, there is slippage between the inner hollow core of the roll and the chuck. In the past, means have been devised to cause the chuck to expand from the inside to apply more friction to the inner core of the roll. Such devices have included expansible jaws under control of some pneumatic or mechanical system. Other types of chucks use self-expanding surfaces. The expansion is created by a slip ring operating a lever or cam, but requires precisely controllable curved surfaces on the trunnion of the chuck to create the camming action. An example of such a device is shown in Potter, U. S. Patent No. 4,193,633. Similar devices uses sliding bars or ball bearings to achieve the same result, but such devices require complicated construction and/or finely machined surfaces to create the correct type of cam action. An example of this latter type of device is shown in Thievessen *et al.*, U. S. Patent No. 4,339,094.

BRIEF SUMMARY OF THE INVENTION

[0005] A preferred embodiment of the present invention is a self-locking chuck for engaging the hollow core of a tubular roll of material and includes a center trunnion having a central axis of rotation and a plurality of flat peripheral surfaces. A rotatable cage surrounds the trunnion and has a plurality of apertures in which moveable lug members are loosely retained. Each of the moveable lug members has an outer surface for engaging the inside of the hollow core and an inner arcuate surface defining a radial space opposite each flat peripheral surface portion of the trunnion. A plurality of cylindrical rollers extend through the radial space between each of the

moveable lug members and each respective flat peripheral surface. In response to torque applied to the chuck, the cage rotates, forcing the rollers to move along the flat surfaces so as to bear against the inner lug surfaces. This creates a camming action which operates in either direction causing the chuck to self lock by forcing the lugs radially outwardly to engage the inside of a hollow core.

[0006] The foregoing and other objectives, features and advantages of the invention will be more readily understood upon consideration of the following detailed description, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL DRAWINGS

[0007] FIG. 1 is a perspective drawing of a double-acting torque chuck.

[0008] FIG. 2 is a cutaway view of the torque chuck of FIG. 1 taken along the line 2-2.

[0009] FIG. 3A is a cutaway view of the torque chuck of FIG. 1 taken along the line 3A-3A.

[0010] FIG. 3B is a cutaway view of the torque chuck of FIG. 1 taken along the line 3A-3A with the chuck rotated.

[0011] FIG. 4 is an exploded perspective view of the torque chuck of FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

[0012] A double-acting torque chuck 10 includes a base plate 12 and a flanged trunnion 14 coupled to the base plate 12 by a plurality of bolts 16. The trunnion 14 includes a flanged portion 17 and a center axle 15. A cage 18 surrounds the center axle 15. The cage 18, which is rotatable with respect to the trunnion 14, retains radially moveable lugs 20a, 20b and 20c. The cage 18 is held in place by a frustoconical top member 22 which is connected to the central axle 15 by a bolt 22a. As shown best in FIG. 2, the cage 18 has an annular flange 18a. The annular flange 18a rests on a ring 24 which fits into an annular recess in the flange portion 17.

[0013] Three roller bars or cylindrical rods 28a, 28b and 28c fit loosely into slots in top and bottom synchronizer rings 30a and 30b, respectively, which retain the rods sixty degrees apart in parallel

relationship along the outside of the axle 15. The bottom synchronizer ring 30b rests on the spacer ring 24. The central axle 15 includes three flat portions 15a, 15b and 15c, and the three roller bars 28a, 28b and 28c roll along these respective surfaces in response to torque applied in either a clockwise or counter-clockwise direction to the chuck 10.

[0014] Referring to FIGS. 3A and 3B, each of the lugs 20a, 20b and 20c have an arcuate outer surface 23a, 23b and 23c, respectively. These surfaces are congruent with the periphery of an imaginary cylinder whose center is the central axis of the trunnion as represented as dashed line 40 in FIG. 2. In actual practice, these surfaces 23a, 23b and 23c would engage the hollow core of a roll of web-like material (not shown). The lugs 20a, 20b and 20c also have inner arcuate surfaces 21a, 21b and 21c, respectively. These inner surfaces define radial spaces with respect to flattened portions 15a, 15b and 15c of the center axle 15. Each of the cylindrical roller bars 28a, 28b and 28c extend through these respective spaces between the lugs and the trunnion axle 15 and are free to roll along the planar portions 15a, 15b and 15c. The movement of the bars 28a, 28b and 28c is rotationally synchronized by the action of the synchronizer rings 30a and 30b which force the bars to move in unison.

[0015] The lugs 20a, 20b and 20c have inner arcuate surfaces 21a, 21b, 21c. Those surfaces each have a radius of curvature which is not concentric with the central axis of the trunnion 40 as are the outer surfaces of the lugs. Instead, each of the interior surfaces 21a, 21b and 21c of the lugs has a center of rotation or radius of curvature that is offset from the central axis 40 of the trunnion axle 15. This radius of curvature is smaller than the radius of curvature for the outer surfaces of the lugs. The resulting eccentricity between the inner and outer surfaces of the lugs 20a, 20b and 20c provides a double-acting cam action for the chuck that is illustrated in FIG. 3B.

[0016] The chuck fits snugly inside the hollow core of a roll of material (not shown). When the roll turns, friction causes the chuck 10 to initially resist rotation. The cage 18, however, can slip relative to the trunnion's axle 15. When the cage slips, the roller bars 28a, 28b and 28c roll along the flattened surfaces 15a, 15b and 15c. This causes the roller bars to force the lugs 20a, 20b, 20c to move radially outwardly of the cage 18 and into tight frictional engagement with the hollow core. The lugs fit loosely inside the cage 18 restrained only by corner tab members 27 which are formed in the four corners of each of the lug members 20a, 20b and 20c. Thus, the lugs are free to expand within the cage 18 and to apply pressure to the inner core of the roll.

[0017] Although the torque chuck 10 has been shown as having three rollers and lugs, any number of roller bars and lugs may be used. Three such expandible elements represent a simple and cost-effective construction. What is needed is that there be one flat surface on the trunnion, one roller bar and one lug acting together regardless of the number of segments needed. Thus, there could be four or six such flat, roller and lug combinations on the chuck as desired by the user.

[0018] The terms and expressions which have been employed in the foregoing specification are used therein as terms of description and not of limitation, and there is no intention, in the use of such terms and expressions, of excluding equivalents of the features shown and described or portions thereof, it being recognized that the scope of the invention is defined and limited only by the claims which follow.